(12) UK Patent Application (19) GB (11) 2 028 547 A

(21) Application No 7927313
(22) Date of filing 6 Aug 1979
(23) Claims filed 6 Aug 1979
(30) Priority data
(31) 8437/78
(32) 8 Aug 1978
(33) Switzerland (CH)
(43) Application published
5 Mar 1980
(51) INT CL³
G04G 9/08
(52) Domestic classification
G3T 101 301 401 402
403 405 RA
G5C A342 A350 A373 HF
(56) Documents cited
GB 1533102
GB 1529656
GB 1528700
GB 1520379
GB 1515058
GB 1485864
(58) Field of search
G3T
(71) Applicants
BBC Brown Boveri, & Company Limited,
CH—5401 Baden,
Switzerland
(72) Inventor
Peter J. Wild
(74) Agents
A. A. Thornton & Co.

(54) **Electrooptical indicating device**

(57) In a display device, for an electronic digital watch, having an indicating layer which can be varied optically by electric fields, e.g. liquid crystal between two carrier plates, the outer carrier plate is transparent and carries transparent electrodes which are selectively controlled to produce an alpha-numeric display of time and calendar data and in addition, to produce reference symbols e.g. 50, 51, 52, 30a—30c (Fig. 3). The symbols indicate the current function or mode selected (e.g. geographical time, alarm time, chronograph) and the nature of the information in the alpha-numeric displays.

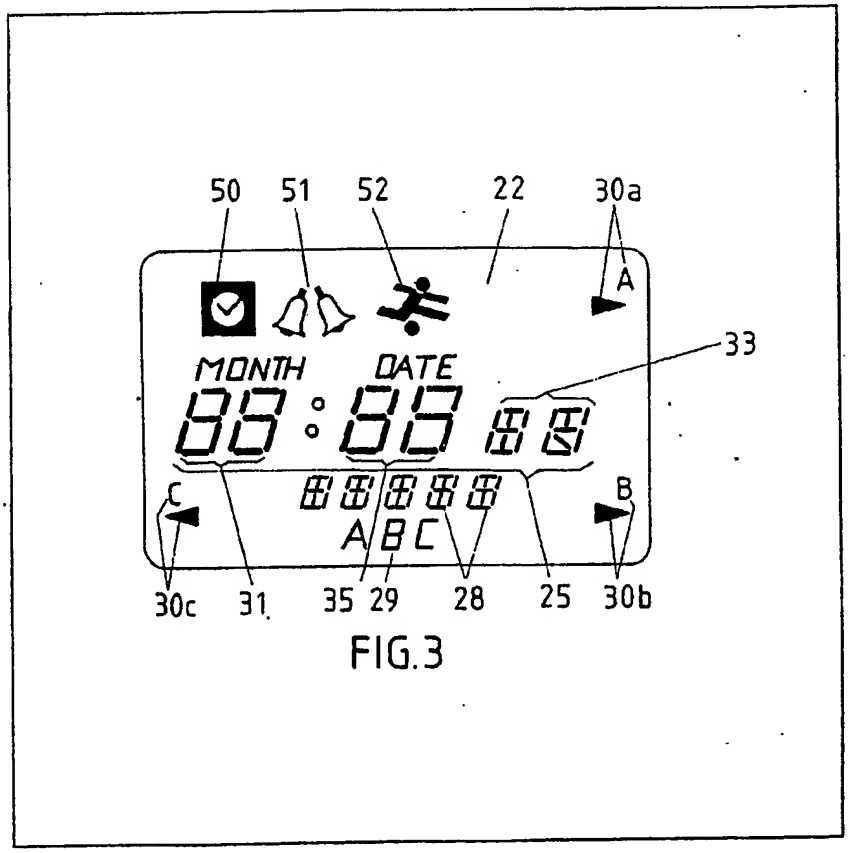

FIG.3

GB 2 028 547 A

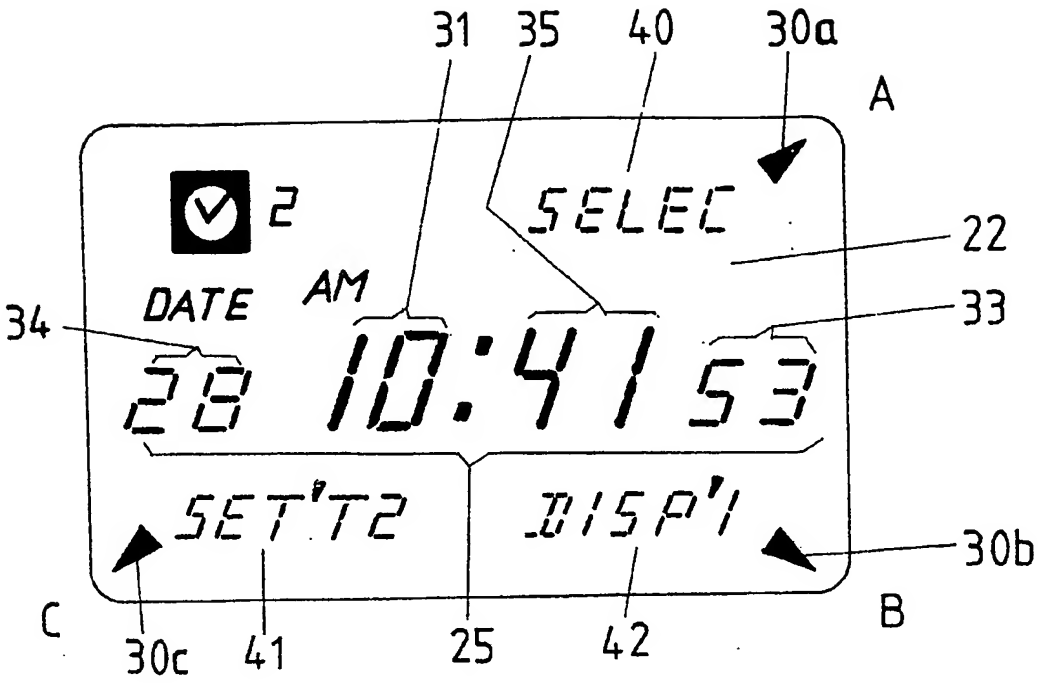
31
35
40
30a
A
2
SELEC
22
DATE
AM
34
33
28
10:41 53
SET'T2
DISP'I
30b
C
B
30c
41
25
42

FIG.1

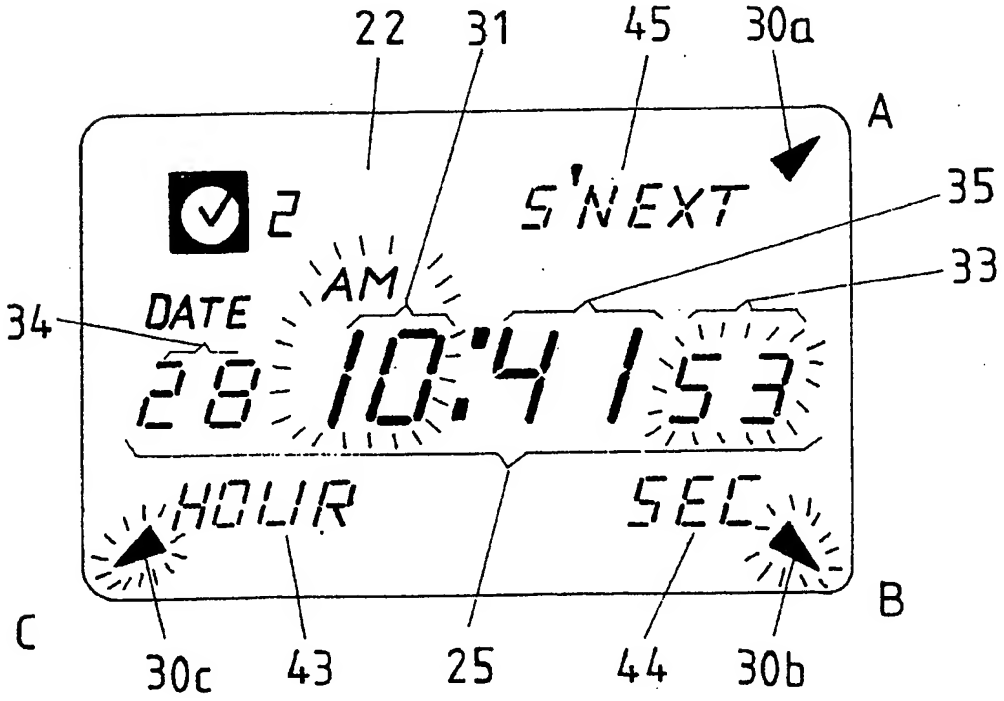
22
31
45
30a
A
2
S'NEXT
35
33
AM
DATE
34
28
10:41 53
HOUR
SEC
C
B
30c
43
25
44
30b

FIG.2

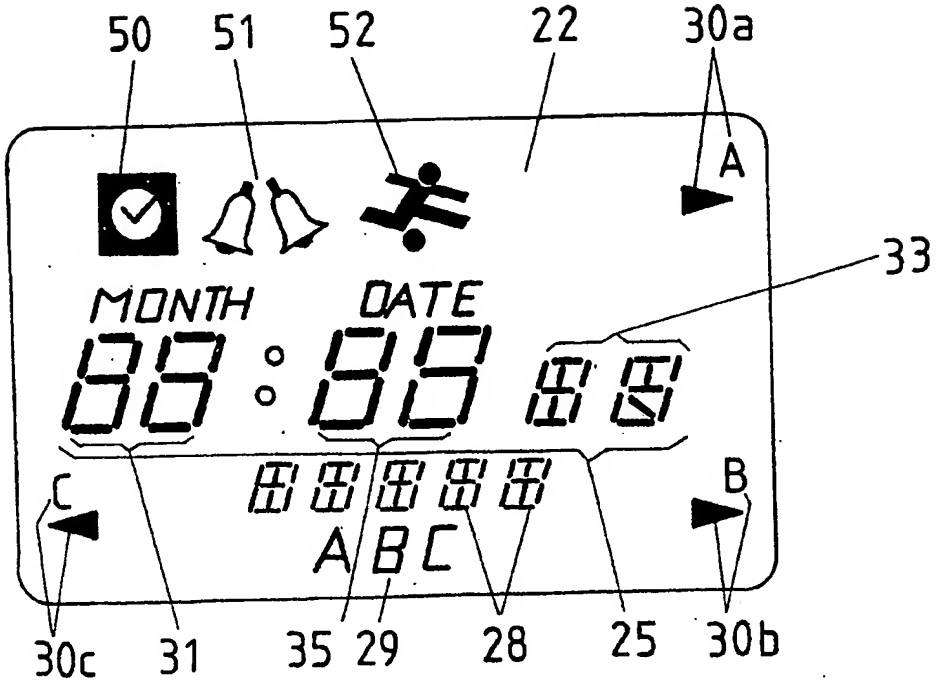
50
51
52
22
30a
A
33
MONTH
DATE
C
B
A B C
30c
31
35
29
28
25
30b

FIG.3

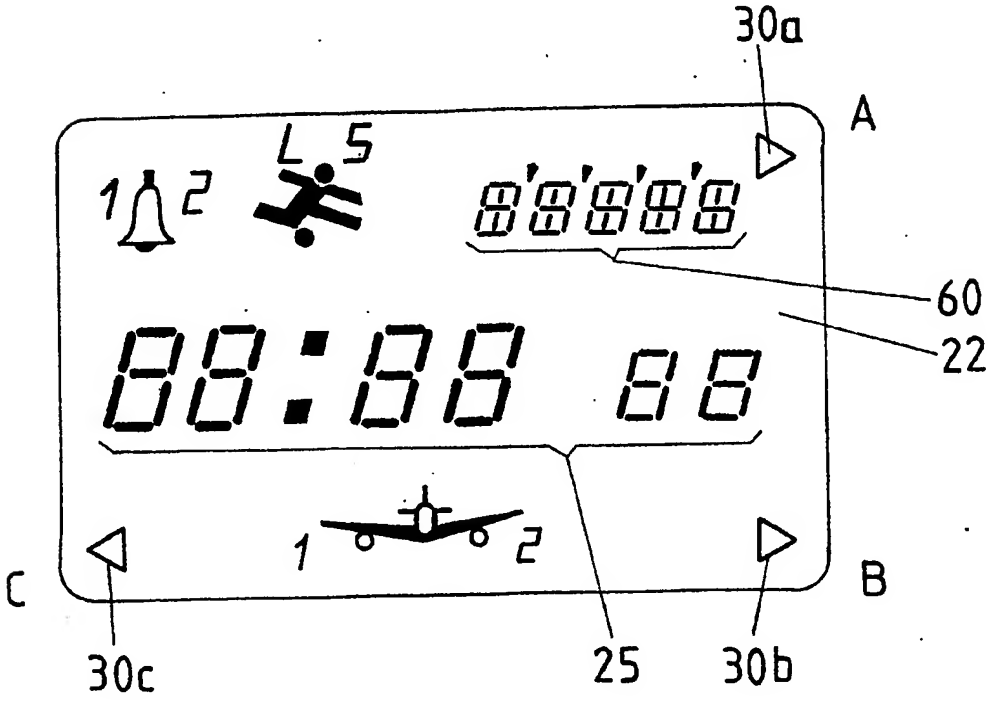
30a
A
L S
1
2
60
22
1
2
C
B
30c
25
30b

FIG.4

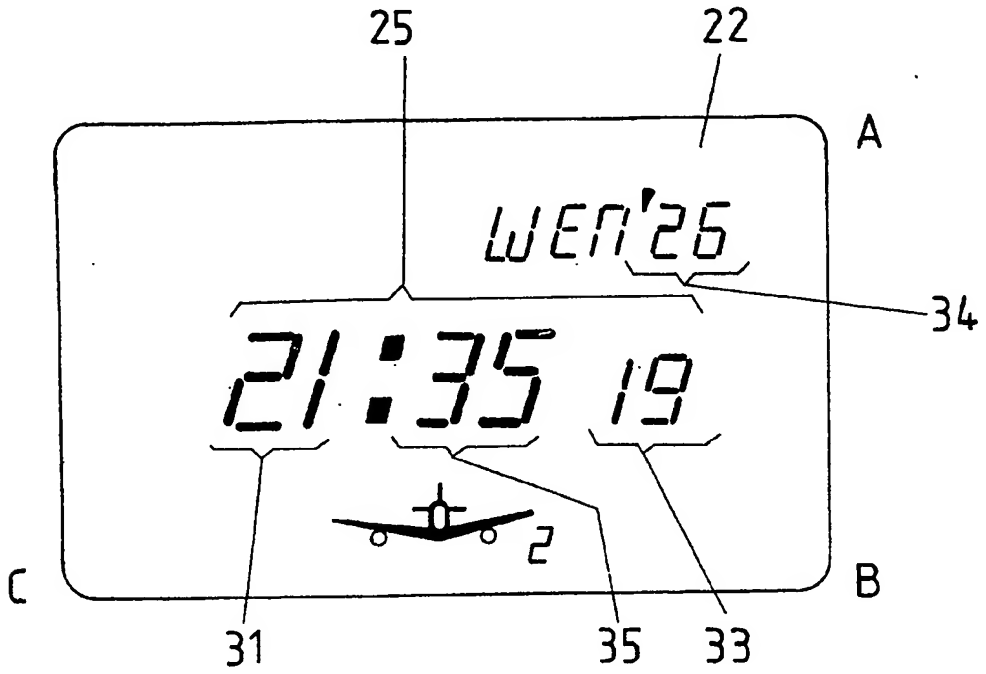
25
22
A
WEN'26
34
21:35 19
2
C
B
31
35
33

FIG.5

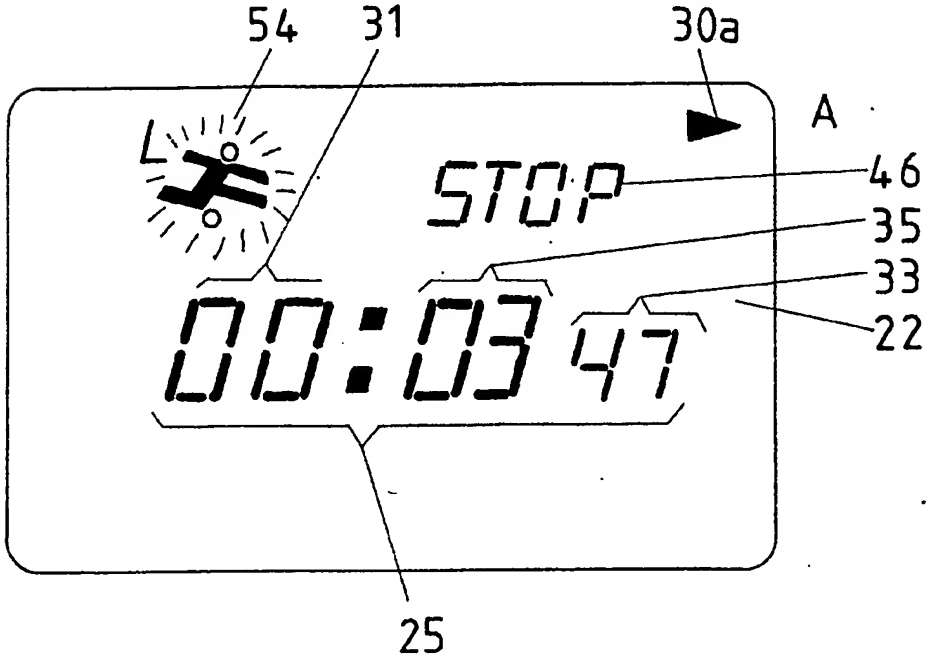
54
31
30a
A
STOP
46
35
33
00:03 47
22
25

FIG.6

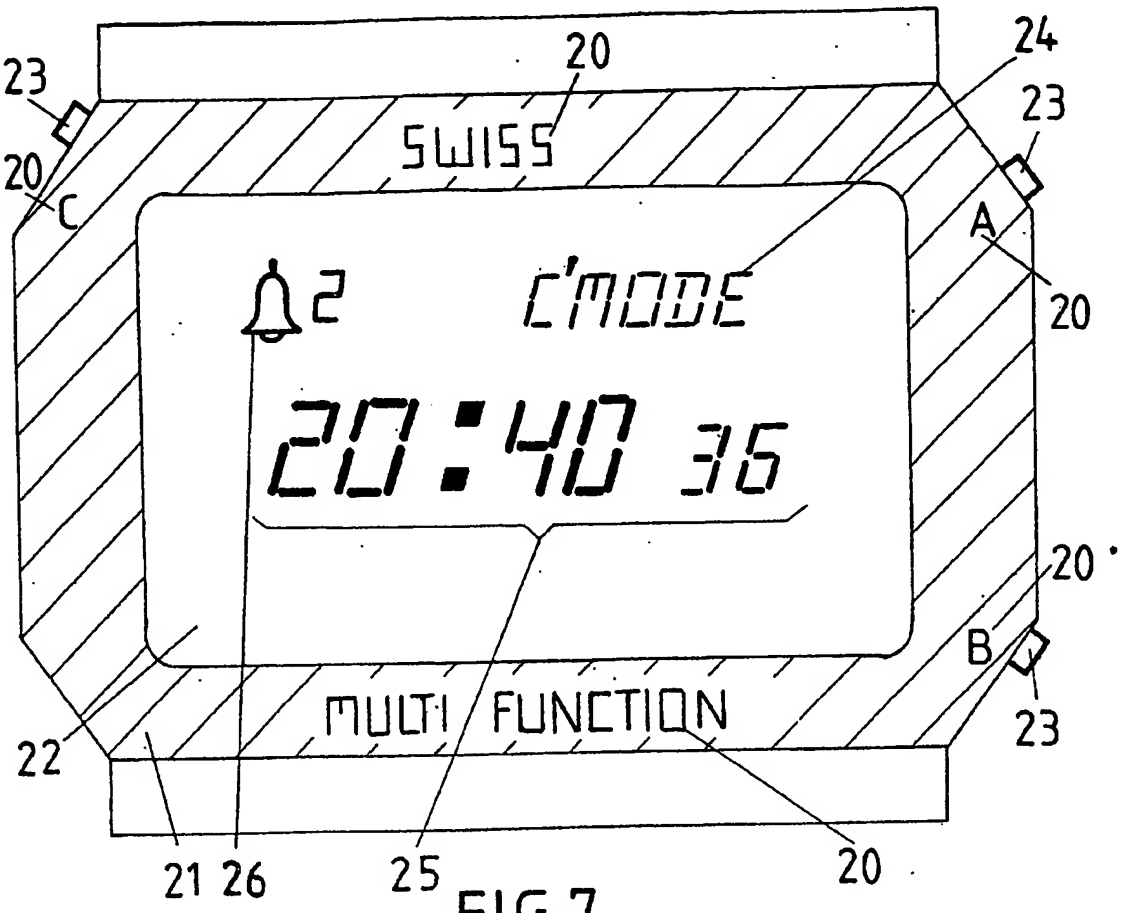
20
24
23
23
SWISS
20
C
A
2
C'MODE
20
20:40 36
20
B
MULTI FUNCTION
23
22
21 26
25
20

FIG.7

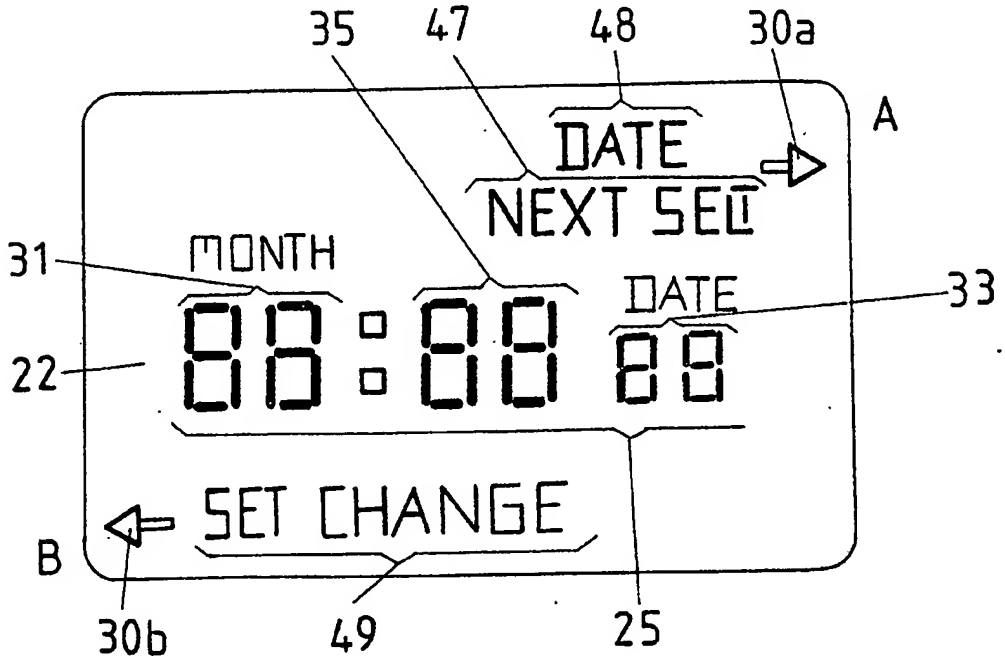
35
47
48
30a
A
DATE
NEXT SEC
31
MONTH
DATE
33
22
88:88 88
SET CHANGE
B
30b
49
25

FIG.8

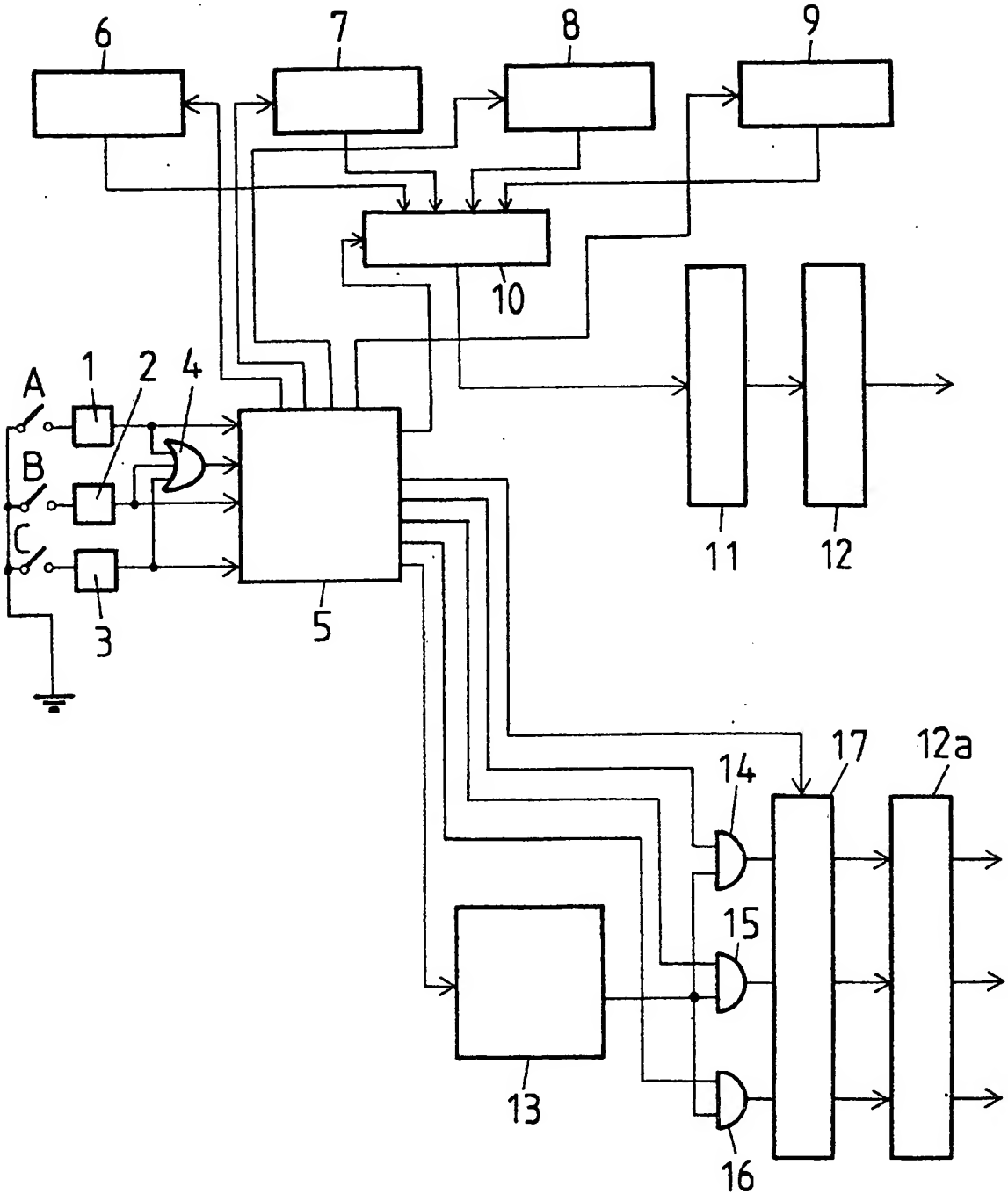

FIG. 9

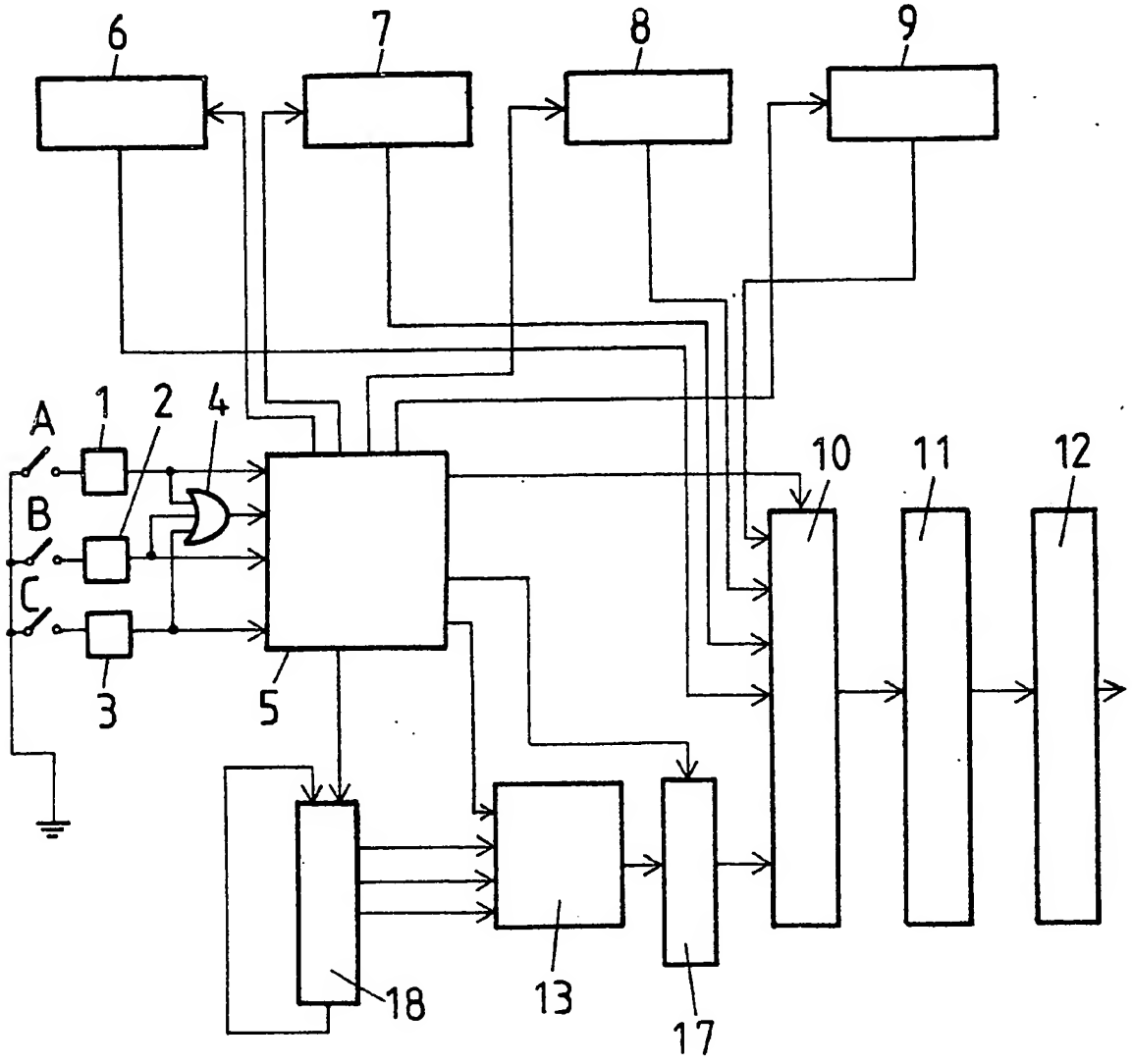

FIG.10

SPECIFICATION
Electrooptical indicating device

The present invention relates to an indicating device of the type having an indicating layer which can be varied optically by electric fields and which is disposed between two carrier plates, at least the carrier plate at the observer side being transparent and comprising at its inner side a multi-part transparent electrode for applying local electrical fields which can be selected electronically so that by a combination of indicating segments, figures, letters, signs or symbols can be represented as main information component indicating regions being provided as explanatory references to the main information indicated or to operating elements which are also provided.

Today, it is generally objected that electronic digital wrist watches, generally with liquid crystal indication, render necessary an operation which is difficult to understand. Even with simple constructions hitherto known, which only supply the normal time information, adjustment is often only possible with the aid of operating instructions. Purchasers without technical training often do not dare to make alterations; after having found a deviation in time, because such watches no longer indicate the current time after unskilful use of the operating elements. If such a confused owner of a watch seeks out a watch dealer, there is no assurance, even in the business, that the watchmaker will know the logic of all the models offered on the market. These difficulties are particularly pronounced in multi-function watches, with stop-watch operation, world times and several alarm possibilities.

As an example of a known watch logic, attention is drawn to the data sheet of the integrated circuit MJ6, 6 digit/5 function LCD Watch Circuit of Messrs. Philips Elcoma, 8027 Zurich, Switzerland. Here it is a question of a circuit for a digital watch of average complexity, which represents hours, minutes and seconds or hours, minutes and date simultaneously. By actuating a switch A, it is possible to switch backwards and forwards between the two kinds of representation. A second switch B normally serves to actuate the night illumination by means of a microglowlamp. If, after a prolonged period of use, the wearer finds himself in a position where he has to alter the adjustment of the watch (for example after a journey to a country with a different time zone), the beginning of the adjustment sequence may be impossible for him in some circumstances, without operating instructions or a good memory, because he does not try the required simultaneous operation of the two switches A and B. If he succeeds with th beginning, then the next difficulty arises immediately:

The function of th separately actuated switches A and B is n longer th original one as described above. The fact that the switch A leads from one mode of adjustment to the other and switch B alters the adjustment in the mode selected can only be found by experiment without any operating instructions. Unless the wearer happens t make the correct operations, he accidentally brings the valid data of the time measurement out of adjustment.

The operation of complex multifunction watches is even more irksome. Attention is drawn to the known construction of Citizen, model 40—1. With this construction, even technical specialists cannot manage without operating instructions. The associated instructions comprise 20 pages. It is true that in order to facilitate it, the information of the digital indications instantaneously indicated is identified by suitable symbols. Thus a sporting runner indicates stop-watch operation, for example. Symbols for the same purpose are also known already in the known liquid-crystal indications, Type LC 201960—000 of BBC Aktiengesellschaft Brown, Boveri & Cie, Baden, Switzerland or from German patent application publication 26 46 194.

Nevertheless the operation of the Citizen watch, model 40—1 is by no means simple. It may merely be mentioned that when representing the normal time information, symbols for alarm and stop-watch operation may also appear simultaneously, to say nothing of the operations for altering the various adjustments.

There is therefore the clear necessity of facilitating the operation of such indications by references explanatory of the indication. A step in this direction was taken in that the most important possible operations of the individual operating members were printed at the periphery of the face of the Citizen watch model 40—1. This information is not clear however, because, for reasons of space, not all the possibilities can be printed and the user does not know which of the information applies at the moment.

The solution known from German published patent application 25 01 973 goes a step further. Here the required function or the required mode of adjustment is notified to the watch electronics through a mechanical rotary selection ring, via electrical sensors. The selection can be made clear. It is a question of an expensive electromechanical solution, however, which does not fit well into the concept of all-electronic watches. Also the reaction time during stop-watch operation or adjustment of the seconds after an acoustic time signal is intolerably long. In this connection, however, attention is drawn to the improvement, known from Swiss patent 3337/70, of an additional push-button.

Further extensions are known from German patent 2 432 390 and from German published patent application 2 646 169. In German patent 2 432 390, the sequence of adjustm nt states preset by the electronics is made recognizable by additional indicating symbols. In Figure 4 of this specification, different dots appear to identify the mod of adjustment. With this solution, however, the functions of th two push-buttons are not cl arly explain d. In the normal time indicating state, button A is also used for switching over

between hours, minutes and date, seconds. During the adjustment, the different functions of A and B are not bvious without experiments b ing made. In German application 2 646 169, the representation of 3 store contents for waking times is identified by an indicating symbol in each case. Electronically controlled references to the instantaneous function of the 3 setting members are lacking, however.

In accordance with this invention there is provided an indicating device with an indicating layer which can be varied optically by electric fields and which is disposed between two carrier plates, at least the carrier plate at the observer side being transparent and comprising at its inner side a multi-part transparent electrode for applying local electrical fields which can be selected electronically so that by a combination of indicating segments, figures, letters, signs or symbols can be represented as main information, component indicating regions being provided as explanatory references to the main information indicated or to operating elements which are also provided, wherein reference symbols which are controllable electrooptically and which clearly identify respective said operating elements, by their positions or their indications, are provided as said explanatory references, at least some of said controllable explanatory references providing indications which explain the instantaneous operation of respective operating elements.

Embodiments of this invention to be described herein, while exhausting the possibilities of electrooptical indications for the clear representation of the instantaneously valid functions of the operating elements by means of suitable logical control, represent only the references to the indication which are relevant in the selected state and so to guide the user in the sense of a dialogue between the possibilities of the watch electronics and user decision. In the normal state of representing the local time, the indication should remain restricted to what is essential, that is to say the additional references to the indications which can be controlled should remain suppressed in this state so as not to make the reading of the most important data more difficult.

If the user desires a change, then in a first variant, on actuation of any operating member, only the selection possibilities are indicated. If the user then does nothing, that is to say if no option for change is taken, the references are extinguished again after a period of time preset by the electronics. If, however, during this current indication, a change leading through a plurality of logical decisions (for example adjustment sequenc for local time) is initiated by further actuation of an operating element, then in every state which requires a further decision, the selection possibilities continue to be indicated. In a second variant, after actuation f an operating element, the selection possibilities are indicated and at the same time the function associated with the operating element actuated is carried out.

Naturally, both variants may be realized in one and the same construction, in that, for example, functions with a permanent alteration of the stored data, such as adjustment of the local time or of the alarm time are carried out in accordance with the first variant, while functions which are effective temporarily, such as night illumination or switching over to date indication are executed in accordance with the second variant.

Embodiments of this invention will now be described, by way of examples only, with reference to the accompanying drawings, in which:

FIGURES 1 and 2 are diagrammatic views of a first embodiment;

FIGURE 3 is a diagrammatic view of a second embodiment;

FIGURES 4 to 6 are diagrammatic views of a third embodiment;

FIGURE 7 is a diagrammatic view of a fourth embodiment;

FIGURE 8 is a diagrammatic view of a fifth embodiment;

FIGURE 9 is a block circuit diagram of the embodiment in Figures 1 and 2; and

FIGURE 10 is a block circuit diagram of the embodiments in Figures 4, 5, 6 and 7.

With parallel control, that is to say an electrical external connection for each indicating segment which can be controlled individually, the examples of embodiment described below would necessitate an excessively large number of control connections. By suitable cell technology to produce a low molecule setting angle in the liquid crystal molecules in the marginal layers, for which reference should be made, for example, to Swiss Patent Application 1026/76 or published German Patent Application 2 605 690, and by optimization of the liquid crystal mixtures, however, liquid crystal indications operated sequentially in time-division multiplex can be realized. A particularly suitable method of control for liquid crystal indications is contained in Swiss Patent Application 13197/77 or in German Patent 2 752 602. As a result of the arrangement of the indicating segments in matrix form on which these are based, the number of external connections can be drastically reduced. With this technique, considerably more complex indications with a larger number of indicating segments can be realized. The limit at present applying is about 80 external connections on the two long sides of the liquid crystal wrist-watch indications (40 at each side), which involves a contact raster of about 0.6 mm. With the Zebra elastomer contact strips generally used today, this raster lies at the lower limit for reliable contact-making. In addition, the conducting of the paths on the electronics substrate is correspondingly responsive. Also the costs of contact-making b tween IC chip and electronics substrate increase with th number of connections with the wire bond techniqu .

In the embodiment in Figures 1 and 2, a very complex digital indication 22 is represented which is capable of indicating all important time data 25

and references 40—42, 43—45 simultaneously lectrooptically. Th segments controlled in Figure 1 show a possible state with the following meaning:

The local time of the time zone 2 is: 28th day, 10 o'clock in the morning, 41 minutes, 53 seconds. The switches A, B, C, constructed in the form of push-buttons, disposed laterally and associated with the reference arrows 30*a*, 30*b*, 30*c* have the functions:

A) "Selec": Selection of other functions not identified here, such as stop-watch operation or alarm.

B) "Disp'1" = Selection of local time 1

C) "Set T2" = Initiation of the adjustment of the local time 2.

In this example, the figures are composed of 7 segments and the letters of 14 segments of so-called "starburst" pattern, as known, for example from German published Patent Application 2 409 191, Figure 3. If the additional symbols and annunciators are added then:

8 figures @ 7 segments = 56

15 letters @ 14 segments = 210

Additional signs about = 20

Total segments which can be controlled individually = 286

This number is very high even with the aid of limited time-division multiplex operation. It is possible to reduce this number considerably, however, if the letters are not made completely controllable. For this purpose the reference abbreviations 40—45 are assembled, superflous indicating segments are omitted and only commonly used segments are electrically connected. Such simplification variants for the representation of abbreviations for days of the week are given in German Application 2 409 191 mentioned above. Any references to the identification of the setting members are absent in this Patent Application, however.

The indication of Figure 1 can also be reduced to a few external connections by means of a special image-point matrix. For this purpose, three lines of information can essentially be formed. Each line consists of 7 to 9 image-point lines. For each sign, a resolution of 5 image points disposed horizontally side by side is used, so that essentially, for example 10×5 vertical image-point columns result. The basic image elements are normally square of substantially circular overlapping regions of line and column electrodes. In exceptional cases, however, the overlapping regions may have practically any shap , so as to realize the special indicating symbols of Figure 1. With such clear matrix-lik arrang ments, sequential control is indispensable.

Novel possibilities for the sequence of states, for example the sequence of adjustment, result for the embodiment of Figure 1. Without risk of confusion, more than one time information can be made adjustabl in the same mode of adjustment by different switches A, B, C. Figure 2 shows such a state of adjustment as may occur, for example, after actuation of the switch C in Figure 1. The hour figures 31 and second figures 33 blink as do the reference arrows 30*b*, 30*c*, to B and C. In order to make the correlation even clearer, hours 31 and C reference arrow 30*c* on the one hand and seconds 33 and B reference arrow 30*b* on the other hand may be controlled alternately, each for 0.5 sec. for example. If this state of adjustment is no longer needed, the switch A is actuated to change over to the next state of adjustment in which, for example, the date 34 and the minutes 35 can be altered simultaneously. In a further state of adjustment, the year and month would have to be adjusted, in which case references in the manner of 40—42 or 43—45 would simultaneously identify year and month in the fields where date 34 and seconds 33 normally appear. In this last state of adjustment, "DISP'2" for example appears at A. It will be observed that for the complete readjustment of the local time 2, only 3 states of adjustment have to be passed through whereas normally about double the number of steps are necessary, as is necessary, for example for the embodiment described in the above-mentioned data sheet MJ 6 of Messrs. Philips.

The embodiment of Figures 1 and 2 is somewhat extensive, particularly for wrist watches, because there is too little space for 8 clearly legible figures in one line, as is provided here for the time data 25. Therefore solutions with up to 6 figures in a line are more suitable for this application. On the other hand, the reference words 40—45 for the push-buttons A, B, C do not need to be of the same size and legibility as, for example, the figures 31, 35 for hours and minutes.

Figure 3 shows an embodiment which can well be realized from the necessary area. In the normal state, the 6 figures 31, 35, 33 show hours, minutes and seconds. The abbreviation for the references to push-button functions consists of 3—6 signs, in the example shown, five 9-segment signs 28 and 3 additional letters A, B and C which can be controlled (provided with the reference numeral 29 in Figure 3), and which, each in combination with a reference arrow 30*a*, 30*b*, 30*c* and further associated letters A, B and C, which can be controlled and which are likewise designated by 30*a*, 30*b*, 30*c* In Figure 3, refer to the corresponding push-buttons. In addition, operating state symbols 50, 51, 52 for time zone, alarm and stop-watch operation can be controlled. In the normal state, the reference "DATE A" together with "A arrow" may appear permanently, after which, when the button A is pressed, the corresponding data, month, day and alphanumerical day of the week appear. Alternatively, all references may be suppressed in the normal state. The embodiment shown in Figure 3 may also be constructed in accordance with the first variant mentioned above so that

when any f the switches A, B, C constructed in the form of push-buttons, is actuated, this only produces references for further possible pr cedure, but not yet any change in information. Thus the references "DATE A", "ALARM B" and "CHRON C" may appear in succession each for one second, with the corresponding arrows 30*a*, 30*b*, 30*c*. If one of the 3 buttons at A, B, C is then actuated, the reference sequence is immediately interrupted and the required information is indicated with the further possibilities.

A further advantageous solution is illustrated in Figure 4. Here the reference line 60 serves to represent alphanumeric day of the week and date during the local time information. In comparison with the solution of Figure 3 there is the advantage that all the important data of the local time are indicated simultaneously. Naturally, this embodiment as shown in Figure 4 may also be constructed in accordance with the first variant mentioned above. In this case if any button A, B, C is pressed, then day of the week and date would disappear and the reference abbreviations together with the corresponding arrows 30*a*, 30*b*, 30*c* for the push buttons A, B, C would appear sequentially on the same line 60. The additional letters A, B, C of Figure 3 are omitted. They are not absolutely necessary. The correlation of reference word 60 and arrow can be made clear by suitable blinking operation.

Figure 5 shows, for the embodiment of Figure 4, a state of the local time zone 2 with the time information 26th day, Wednesday, 2100 hours, 35 minutes 19 seconds.

Figure 6 represents a state in chronometer operation. The blinking symbol chronometer 54 together with the letter L identifies the information indicated as an intermediate time, "lap time". The reference 46 "Stop" with arrow 30*a* indicates the function of the button at A. The chronometer can be stopped with the button at A. The further possible functions such as "SPLIT" are given cyclically by arrow 30*b* and "DISP'N" with arrow 30*c*. If the button at A is actuated at any moment (even if another reference is being indicated), then the chronometer is stopped. For a time of 2 seconds, for example, the 1/10th and 1/100th seconds of the stopped time appear in the field of the reference sign 46. Then the information of the fractions of seconds is automatically extinguished and the references to the new selection possibilities appear. An indication as shown in Figures 4, 5, 6 consists of about 100 segments which can be controlled individually. If a time-division multiplex operation with 50% pulse duty factor is used, then the number of external connections is about 50 which does not involve any technical difficulties.

Figure 7 shows a further embodiment without arrows as reference symbols. In this sense, the 3 arrows could also be dispensed with in the examples shown in Figures 4, 5 and 6, if the letters 20 (A, B and C) were printed on the edge 21 of the dial at the push buttons 23. The following references: A'LITE, B'SET, C'MODE w uld then appear in succession, for example, in the reference field 60.

In Figure 7, the printed writing is designated by 20, the frame of the dial by 21 and the electrooptical indicating region by 22. The switches at A, B and C, constructed in the form of push buttons are designated by 23 and the controlled reference word for the switch C is designated by 24. The line for the time data is designated by 25 and the operating state symbol for the alarm time 2 is designated by 26.

A simplest form of using the idea of the invention is illustrated in Figure 8. Here it is a question of an indication 22 which can be used, for example in combination with the integrated CMOS circuit on the said data sheet MJ 6 of Messrs. Philips, with parallel control. The references 47, 48, 49 are here not composed of 9-segment signs with great flexibility, but annunciators, that is to say preset words, are etched into the electrode layer of the indication. The individual words "SET", "DATE", "CHANGE", "NEXT" form electrical units and each have only one external connection. In order to combine the words "SET" and "SEC" in a space-saving manner at A, the last letter is divided into 3 parts, which, in suitable combination, give the letters C and T. As a peculiarity of the corresponding adjustment logic, here the adjustment sequence is initiated by pressing the buttons at A and B simultaneously. If the button at B is pressed during the normal time indication, then the two arrows and the word "SET" are each indicated for about 2 seconds, so as to indicate this possibility.

With digital indications as in Figures 1 to 7, it is logical to store the vocabulary of the words to be used in a Read-Only Memory (ROM) if the watch electronics are constructed accordingly. Since 1977, watch circuits have been in production which work in the manner of a microprocessor, as is known, for example, from the data sheet of Messrs. Eurosil, June 1977 "e 1159 Maskenprogrammierbarer Universal-Uhrenschaltkreis mit Mikroprozessorstruktur" and the date sheet DGC (1978) pages 227—233. The block circuit diagram on page 231 of this publication can be used for the embodiments given here. In this publication, however, no time-division multiplex operation of the liquid crystal indication is provided.

Figure 9 represents a possible circuit for the embodiment of Figures 1 and 2. The operating elements of the watch are designated by A, B, C. 1, 2 and 3 represent anti-vibration buffer circuits, each of which is connected both directly and through the OR-gate 4 to the operating state control logic 5. From the operating state control logic 5, an output leads to a counter 6 for the time zone 1 and one to a counter 8 for the time zone 2. Fr m ach of these counters 6 and 7, outputs lead to the data sel ction 10 for the indicati n. Furthermore, from the operating state control logic 5, one output leads to the alarm pre-selector 8 and one to the stop-watch counter 9, which in turn comprise outputs to the data selection 10 f r

the indication. The output of the data selection 10 for the indication leads through a data converter binary/segment code 11 to the indicating driver stages 12, which then lead to th time indication. Further address outputs lead from the operating state control logic 5 to a Read only memory 13, in which the codings for certain reference words are stored. 3 further outputs of the operating state control logic each lead through an AND gate 14, 15, 16 to an intermediate store 17. The second input of these AND-gates 14, 15, 16 is connected to the Read only memory 13 in each case. One output of the operating state control logic 5 leads direct to the intermediate store 17 from which the three outputs, each for one reference, lead through indicating stages 12*a* to the indication of the references 1, 2 and 3.

Figure 10 represents a further possible circuit for the embodiments of Figures 4, 5, 6 and 7. As in Figure 9, the switches designated by A, B and C represent the operating elements of the watch. 1, 2 and 3 represent anti-vibration buffer circuits which are each connected both directly and through the OR-gate 4, to the operating state control logic 5. From the operating state control logic 5, one output leads to a counter 6 for the time zone 1, one to a counter 7 for the time zone 2, one to the alarm pre-selector 8 and one to the stop-watch counter 9. The counter 6 for the time zone 1, the counter 7 for the time zone 2, the alarm pre-selector 8 and the stop-watch counter 9 are in turn all connected to the data selection 10 for the indication. Furthermore, the operating state control logic 5 is directly connected to the data selection 10 for the indication. The operating state control logic 5 is further connected, through the intermediate store 17, to the data selection 10 for the indication. The operating state control logic 5 also has an output which leads to the 1 out of 3 selector 18 for the cyclic control of various references. This 1 out of 3 selector 18 is provided with a ring loop and comprises three outputs all of which are connected to the Read only memory 13 (ROM) for the addressing. The Read only memory 13 is itself also connected directly to the operating state control logic 5. The output of the Read only memory 13 leads, through the intermediate store 17, the output of which leads directly to the data selection 10 for the indication. The data selection 10 for the indication is through the data converter binary/segment code 11 to the indicating driver stages 12, which in turn lead directly to the indication.

CLAIMS

1. An indicating device with an indicating layer which can be varied optically by electric fields and which is disposed between two carrier plates, at least the carrier plate at the observer side being transparent and comprising at its inner side a multi-part transparent electrode for applying local electrical fields which can b selected electronically so that by a combination of indicating segments, figures, letters, signs or symbols can be represented as main information component indicating regions being provided as explanatory references to the main information indicated or to operating elements which are also provided, wherein reference symbols which are controllable electrooptically and which clearly identify respective said operating elements, by their positions or their indications, are provided as said explanatory references, at least some of said controllable explanatory references providing indications which explain the instantaneous operation of respective operating elements.

2. An indicating device as claimed in claim 1, arranged so that the showings of the explanatory references are suppressed in the normal state, during which the main information is shown, prior to actuation of any said operating element.

3. An indicating device as claimed in claim 1 or 2, arranged so that on actuation of any operating element in the normal state, the explanatory reference is either briefly indicated once in succession for each operating element and extinguished again or all the references are indicated simultaneously for a restricted time.

4. An indicating device as claimed in claim 3, arranged so that when an operating element is actuated for the first time to initiate a change in nature of the main information indicated, only the explanatory references appear and said change is only effected on a further actuation of the corresponding operating element.

5. An indicating device as claimed in any one of the preceding claims, arranged so that certain states of the main information indication require an additional actuation of at least one operating element, in which states the explanatory references are either shown repeatedly periodically or are indicated permanently.

6. An indicating device as claimed in any one of the preceding claims, arranged so that for the purpose of distinguishing between two different selection possibilities, a synchronous control of the associated references and main information components is provided alternately.

7. An indicating device as claimed in claim 3 or 4, in which the explanatory references are energised by a logical OR-function of electronic signals provided by all the operating elements for said restricted time.

8. An indicating device as claimed in any one of the preceding claims, comprising sequential time-division multiplex control, in order to reduce the number of external contacts.

9. An indicating device as claimed in any one of the preceding claims, comprising programmable CMOS logic, employing integrated circuit techniques, to control the indications.

10. An indicating device substantially as herein described with reference to the accompanying drawings.

11. An indicating device as claimed in any one of the preceding claims, employed in a quartz-controlled watch, particularly a wrist watch.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1980. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.